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Hayden

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(54) **EARBUD HEADPHONE ADAPTER**

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H04R 25/00 (2006.01)
H04R 1/10 (2006.01)

(52) **U.S. Cl.**
CPC ***H04R 1/105*** (2013.01); ***H04R 1/1016*** (2013.01); *H04R 1/1058* (2013.01)

(58) **Field of Classification Search**
CPC H04R 1/105; H04R 1/1016; H04R 1/1058
USPC 381/380
See application file for complete search history.

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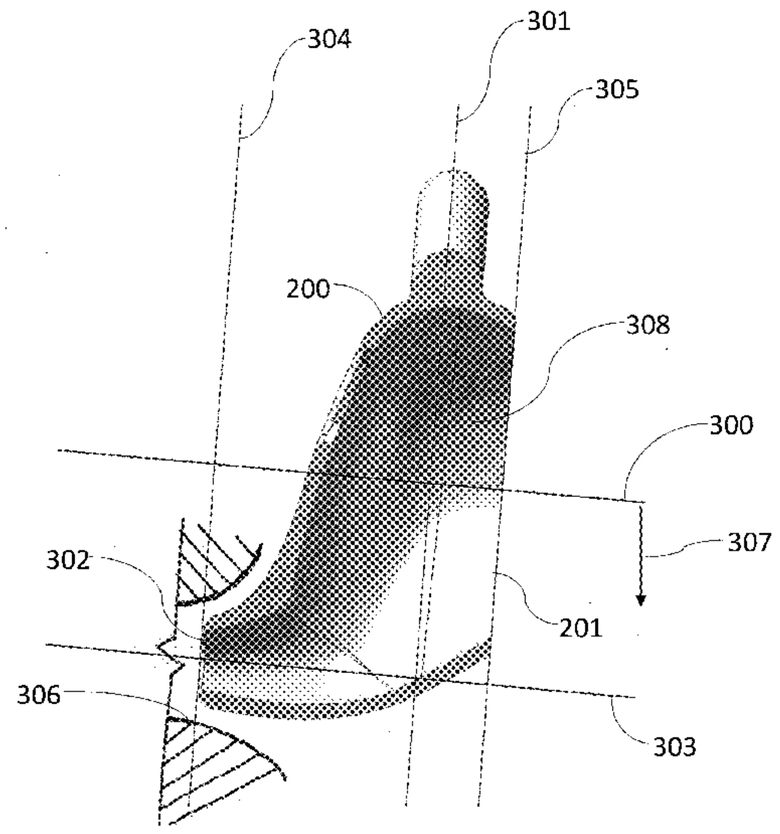
(57) **ABSTRACT**

Embodiments include an earbud headphone adapter configured to securely retain an earbud headphone in a user's ear, preserve the quality of sound emitted from the earbud headphone into a user's ear, and/or reduce the discomfort commonly experienced by users from prolonged wearing of an earbud headphone. A hollow body having a cavity extending from a first plane to an earbud opening about an axis substantially perpendicular to a second plane is configured to stretch over and securely retain an earbud headphone. A portion of the hollow body may taper from the earbud opening to a sound opening. A stabilizer extends from the hollow body generally along the first plane and is configured to engage with the concha area of a user's ear while the sound opening is within the ear canal opening to securely retain the earbud adapter and earbud headphone in the user's ear.

10 Claims, 15 Drawing Sheets



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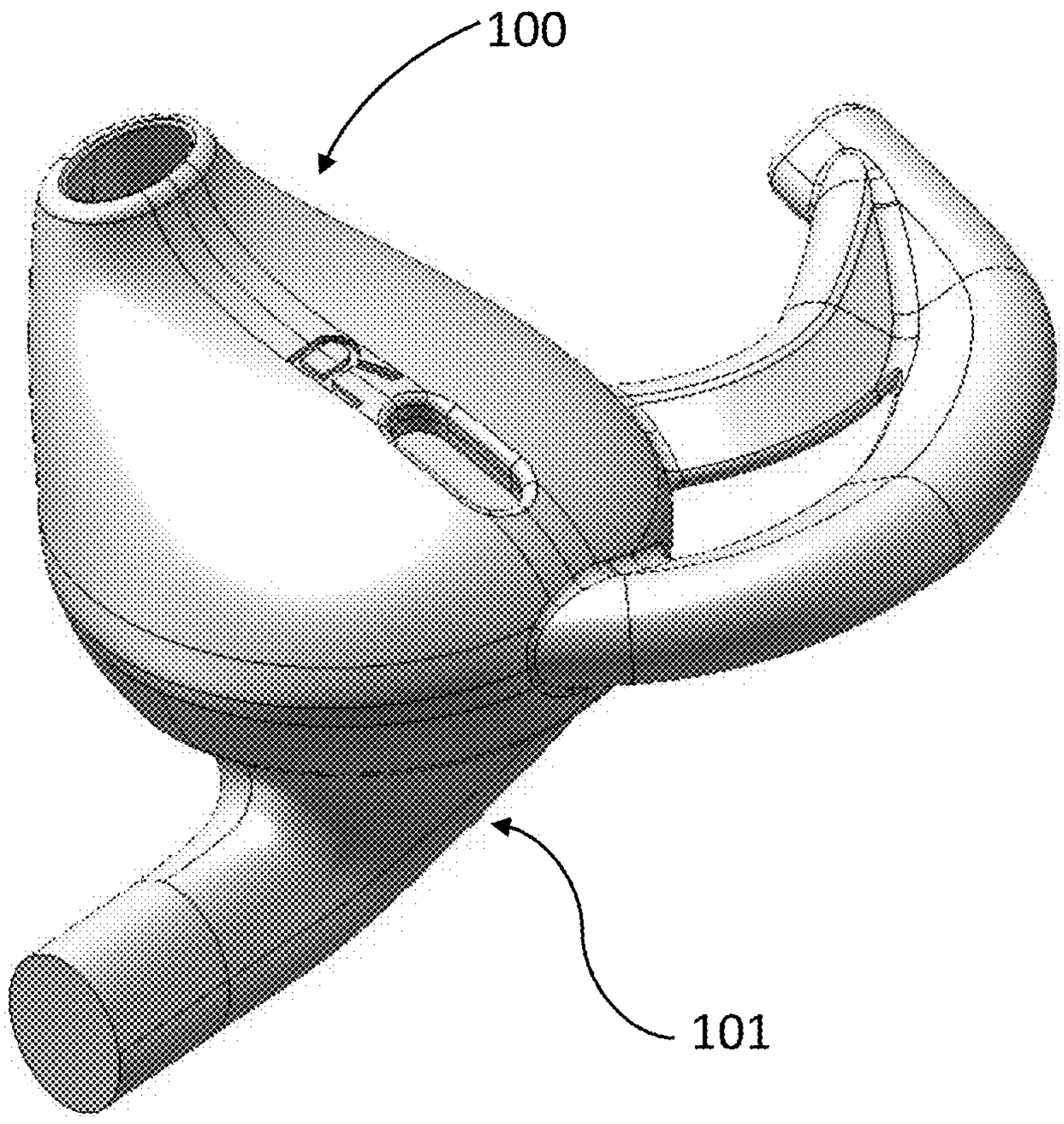

FIG. 1

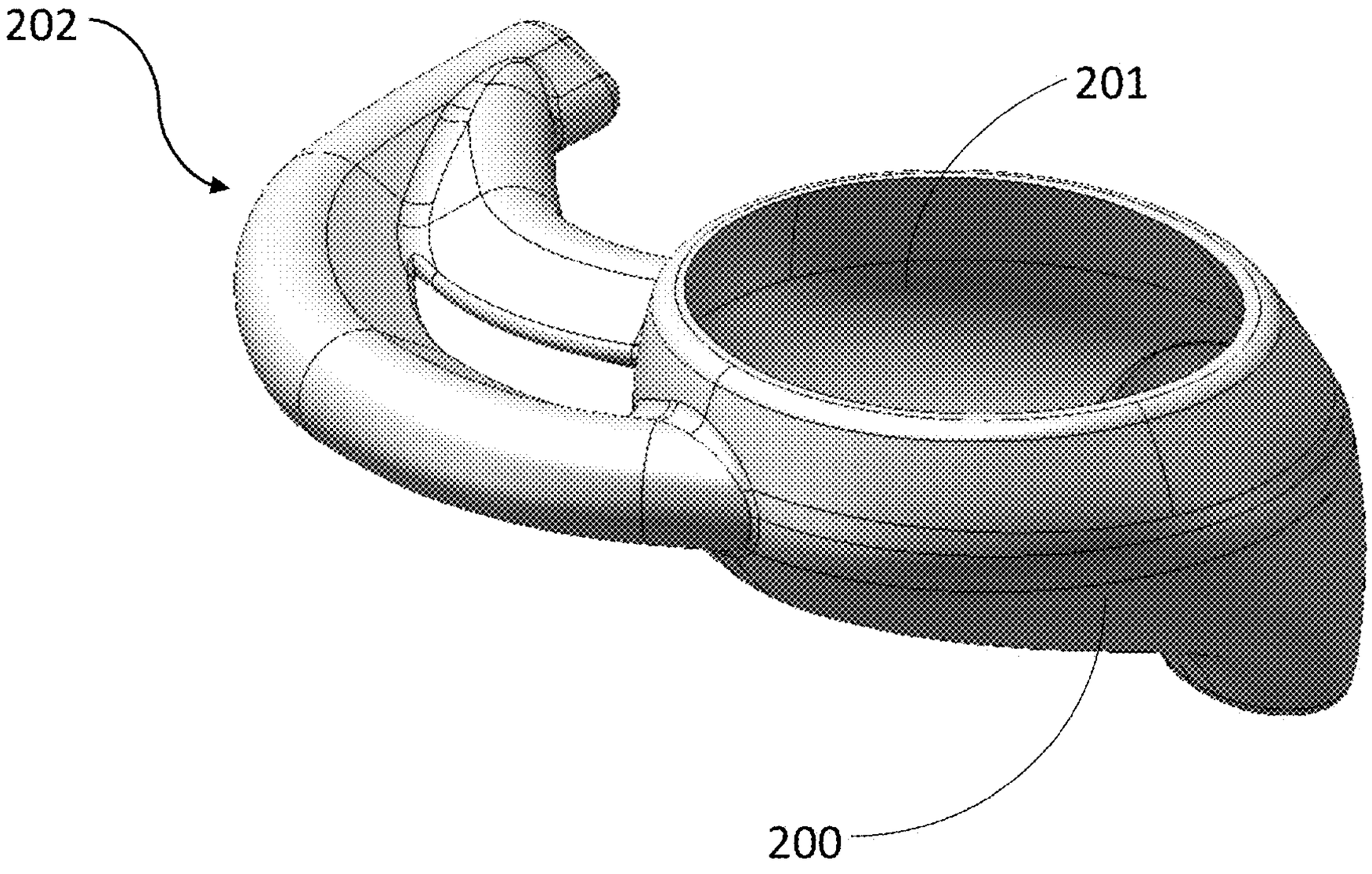

FIG. 2

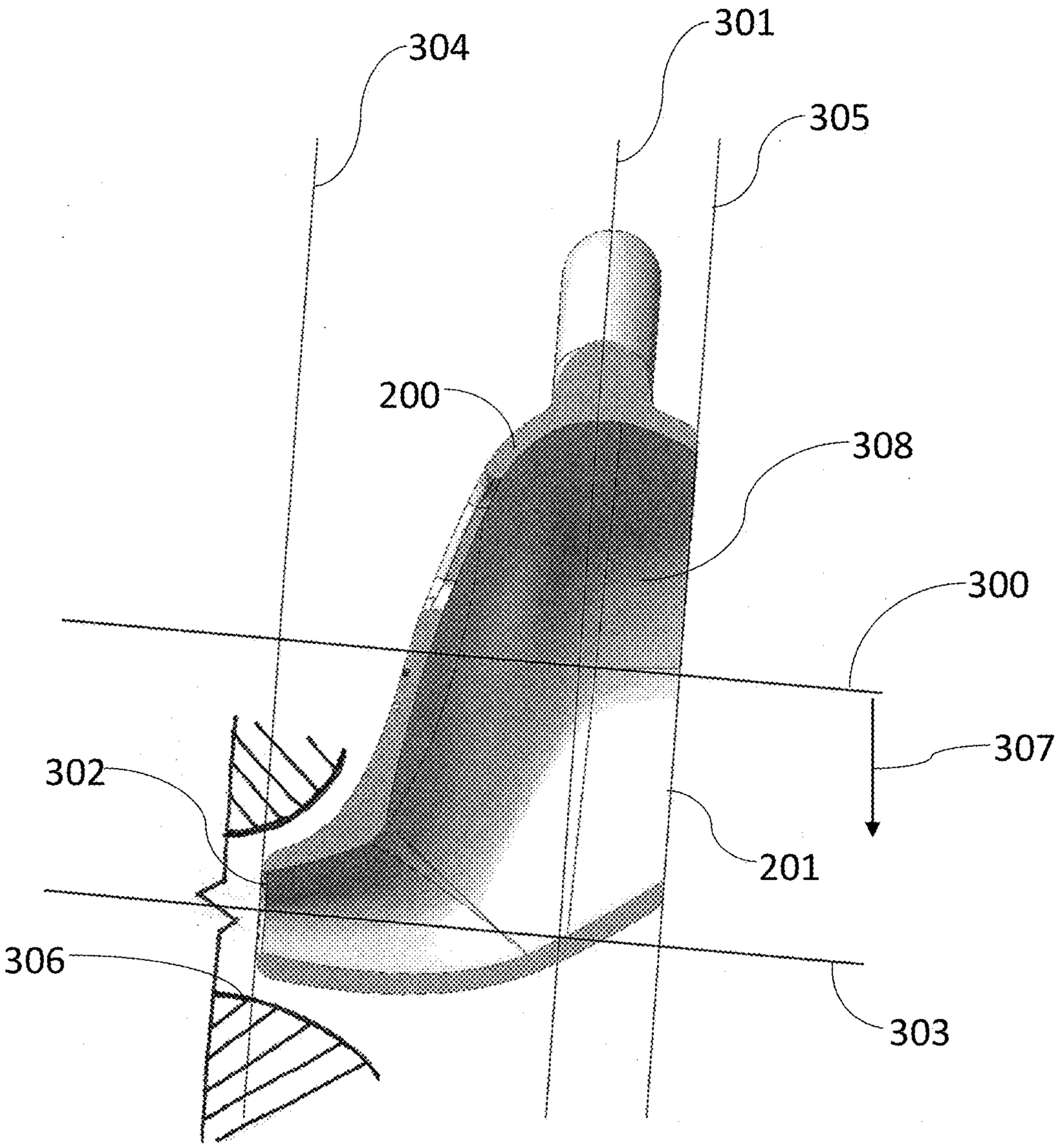

FIG. 3

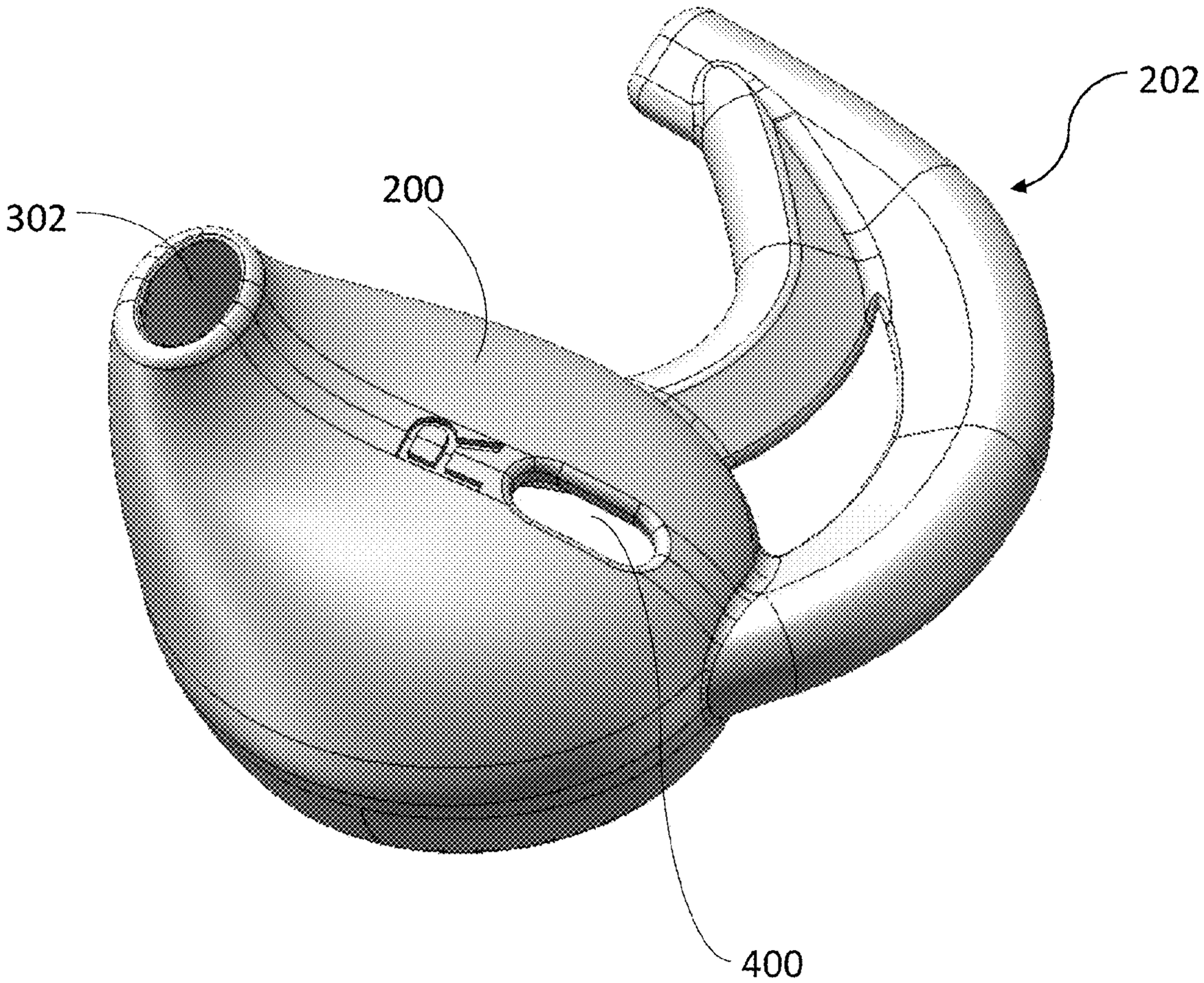

FIG. 4

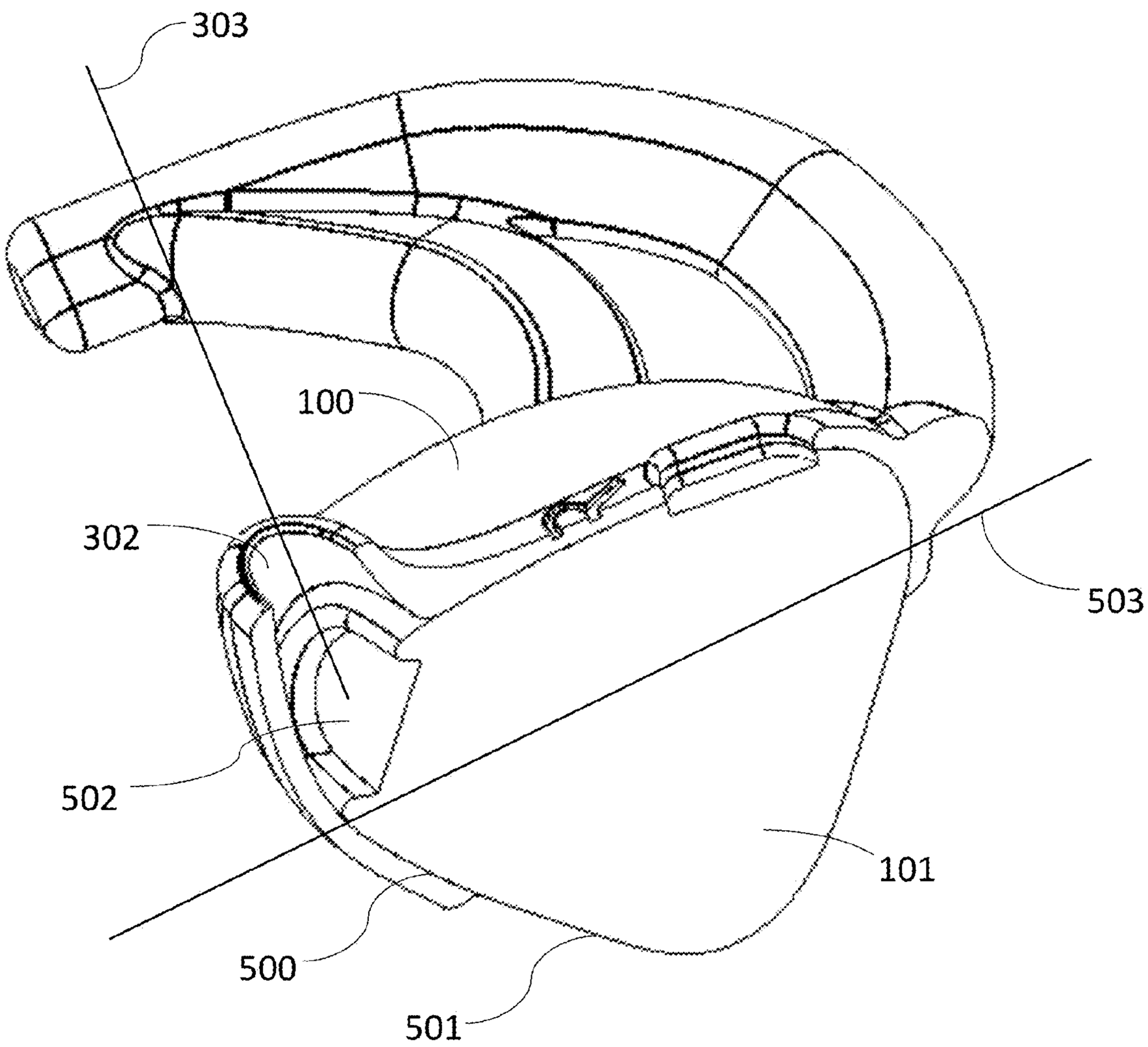

FIG. 5

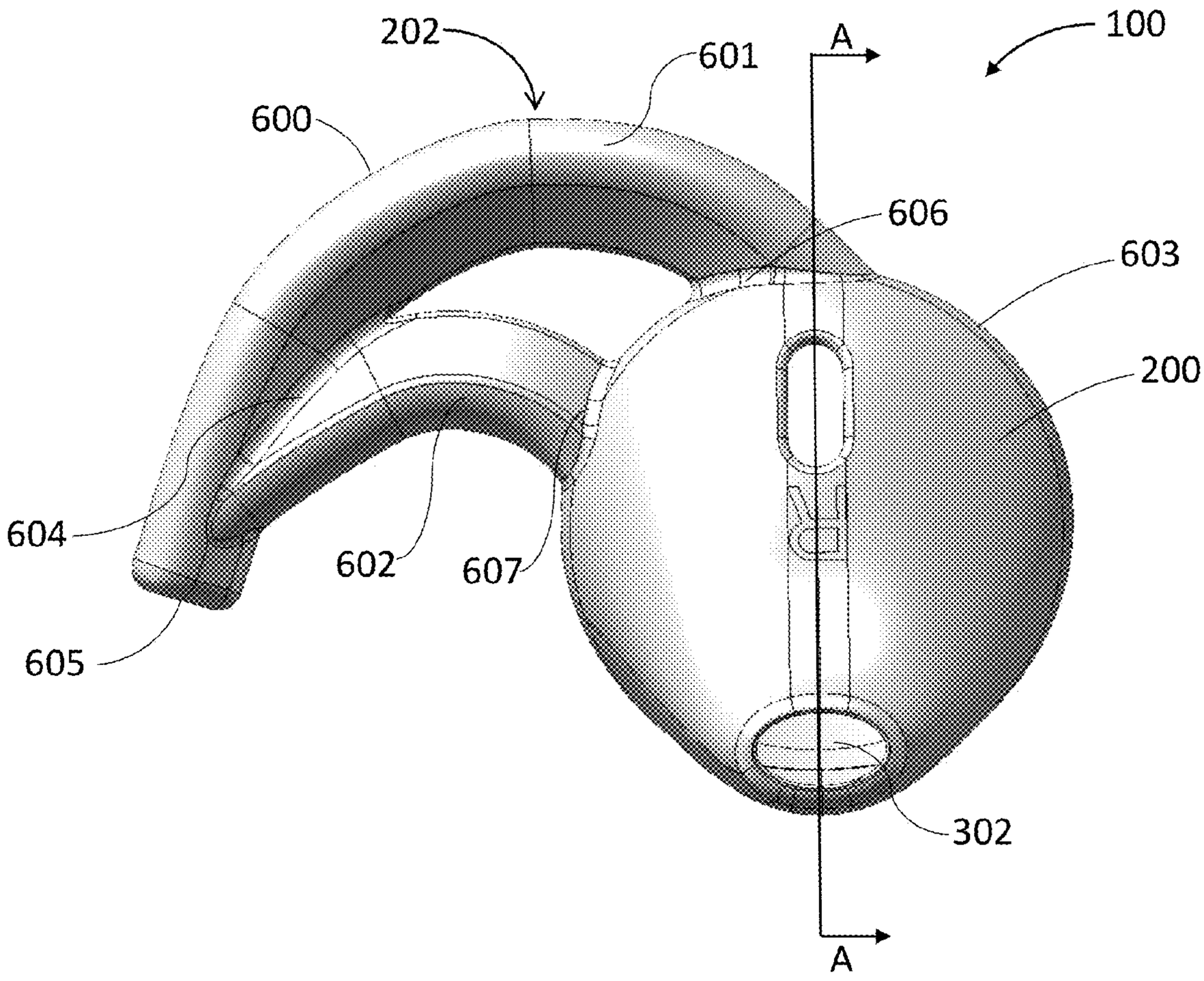

FIG. 6

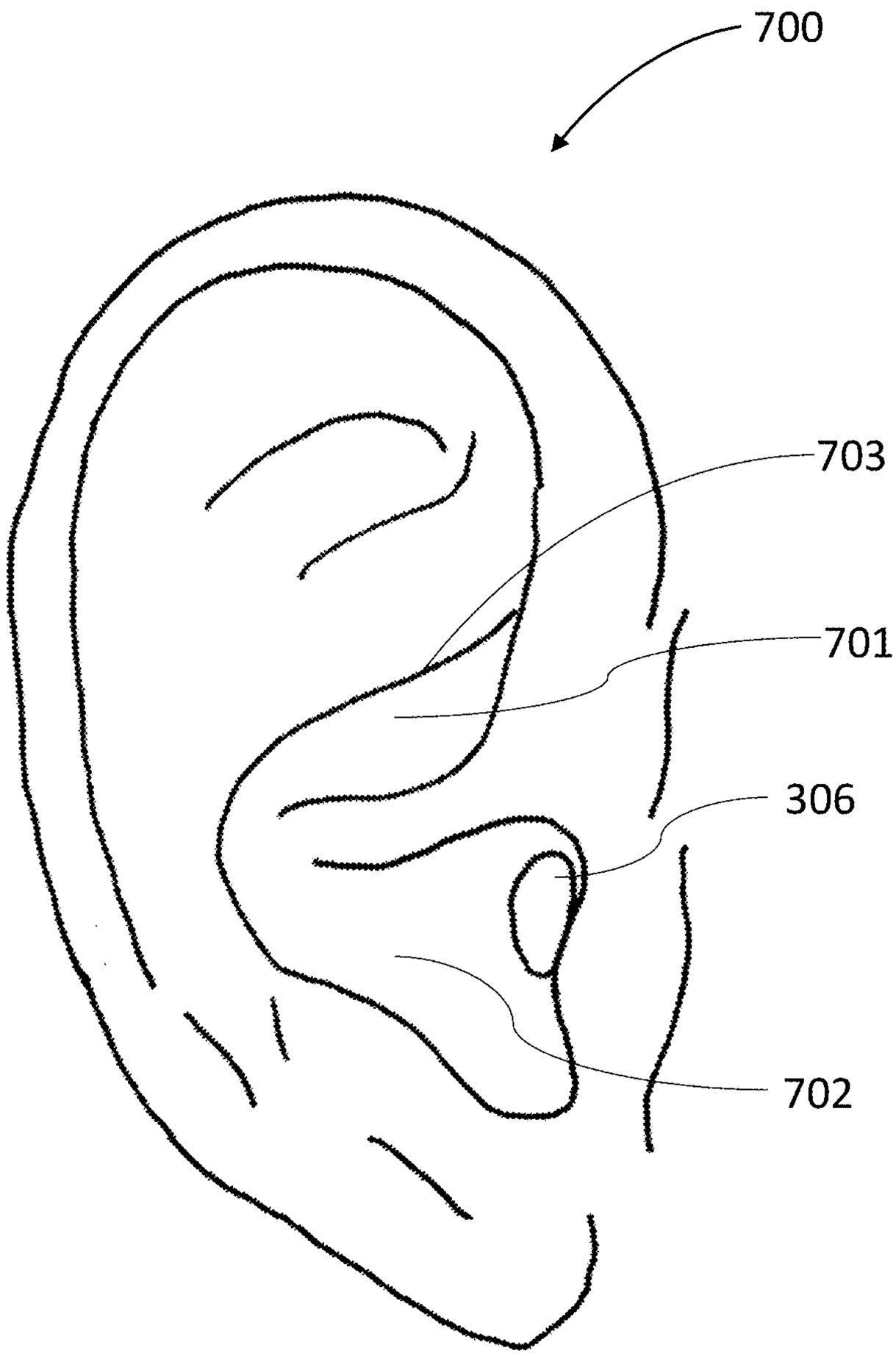

FIG. 7

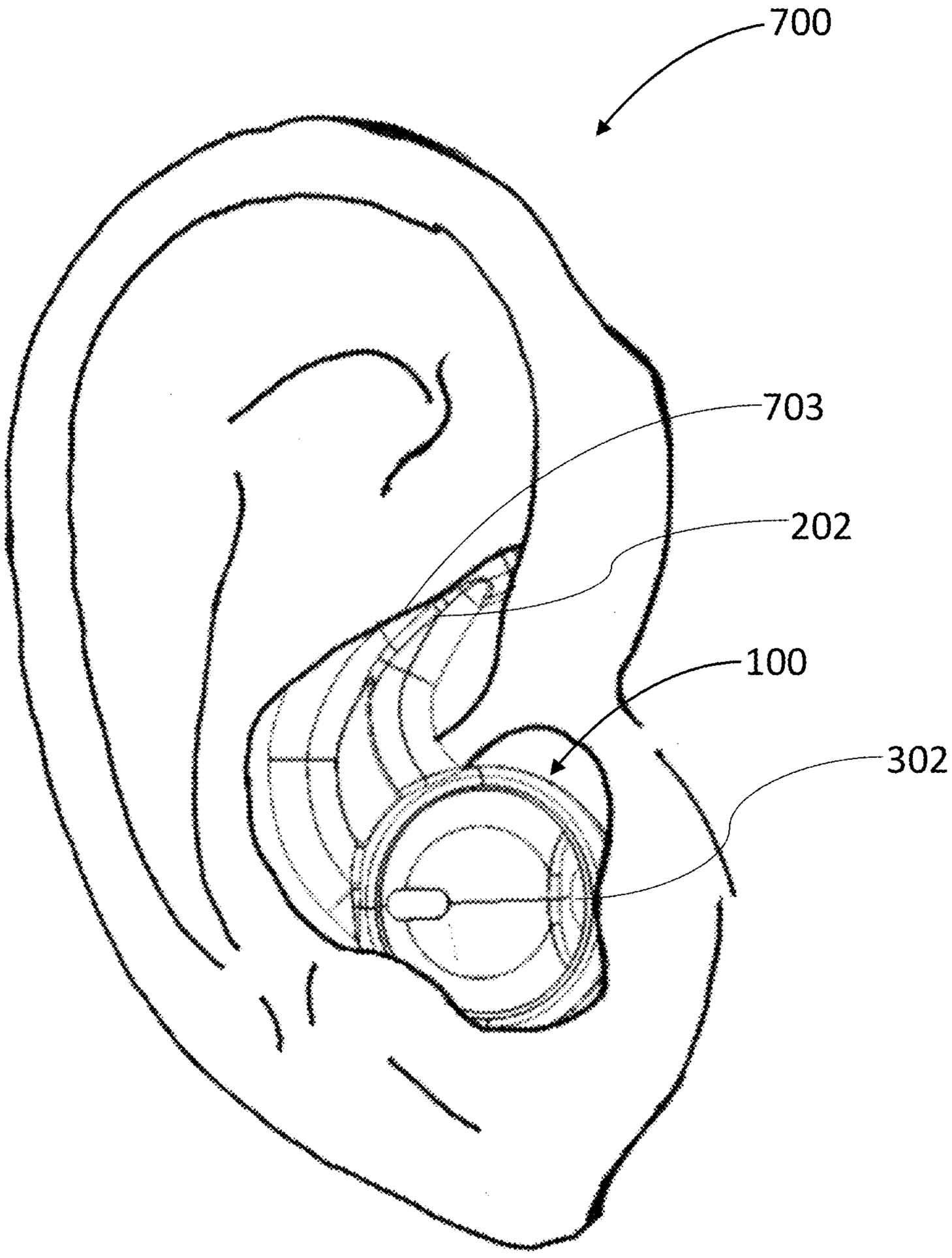

FIG. 8

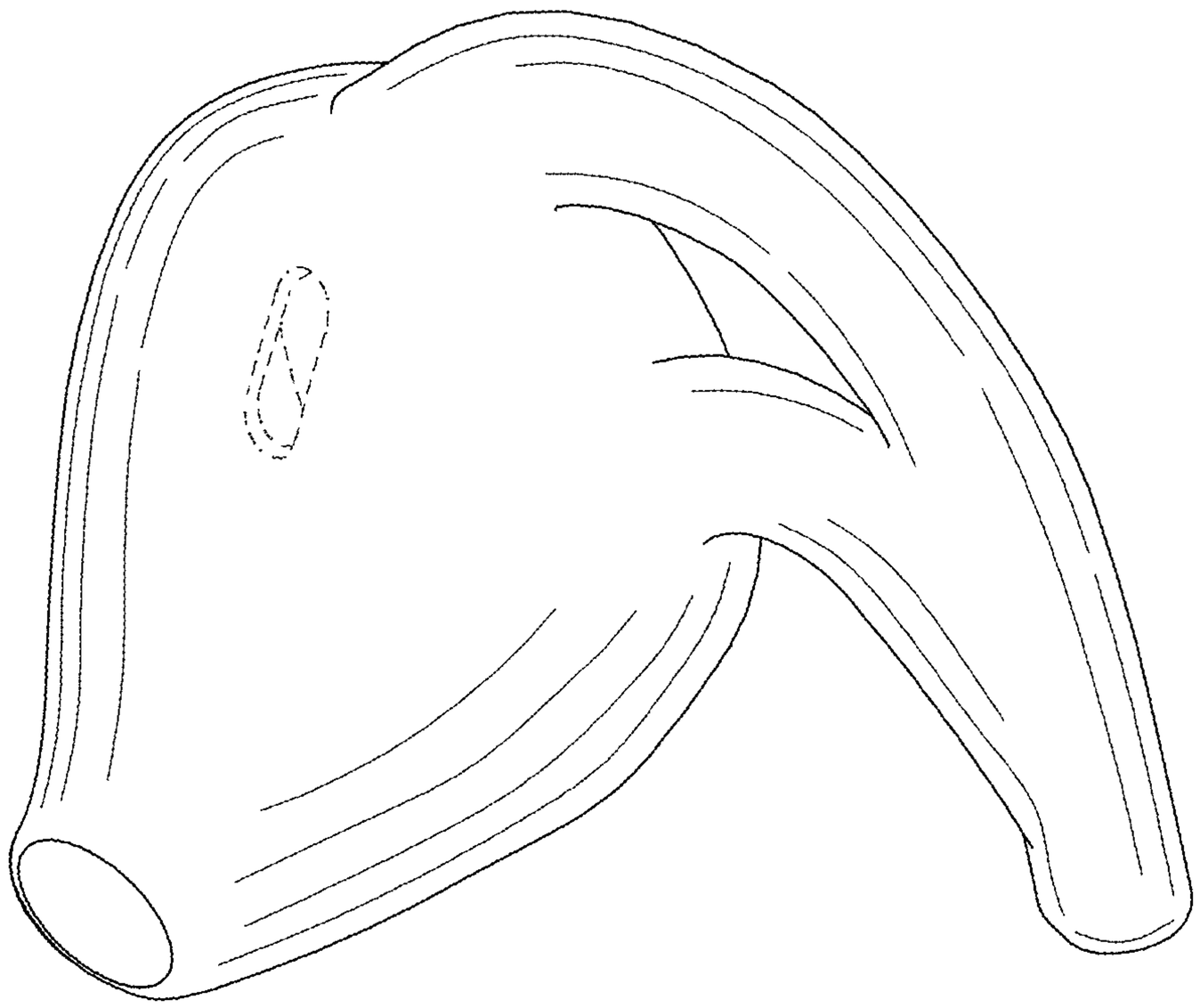

FIG. 9

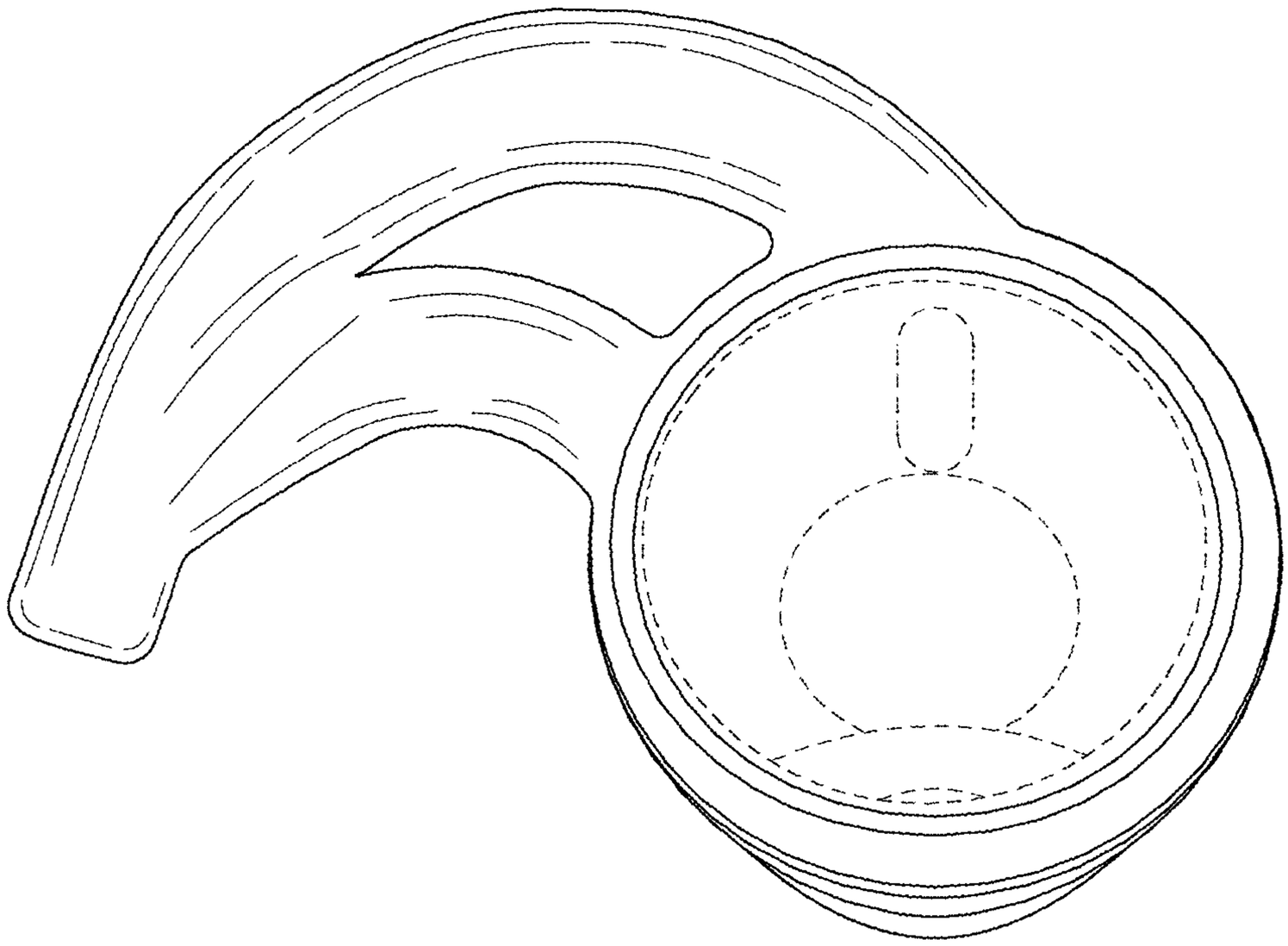

FIG. 10

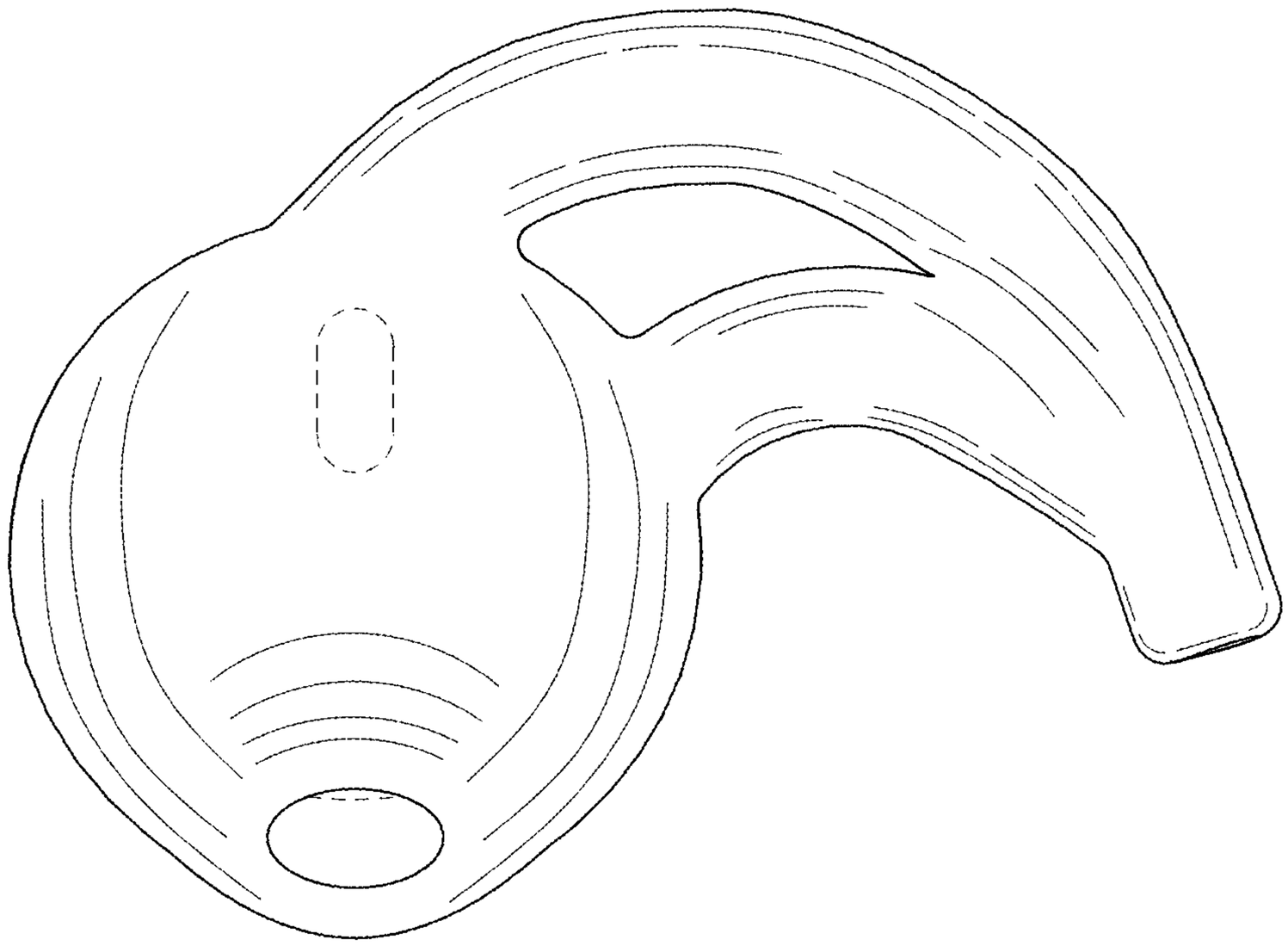

FIG. 11

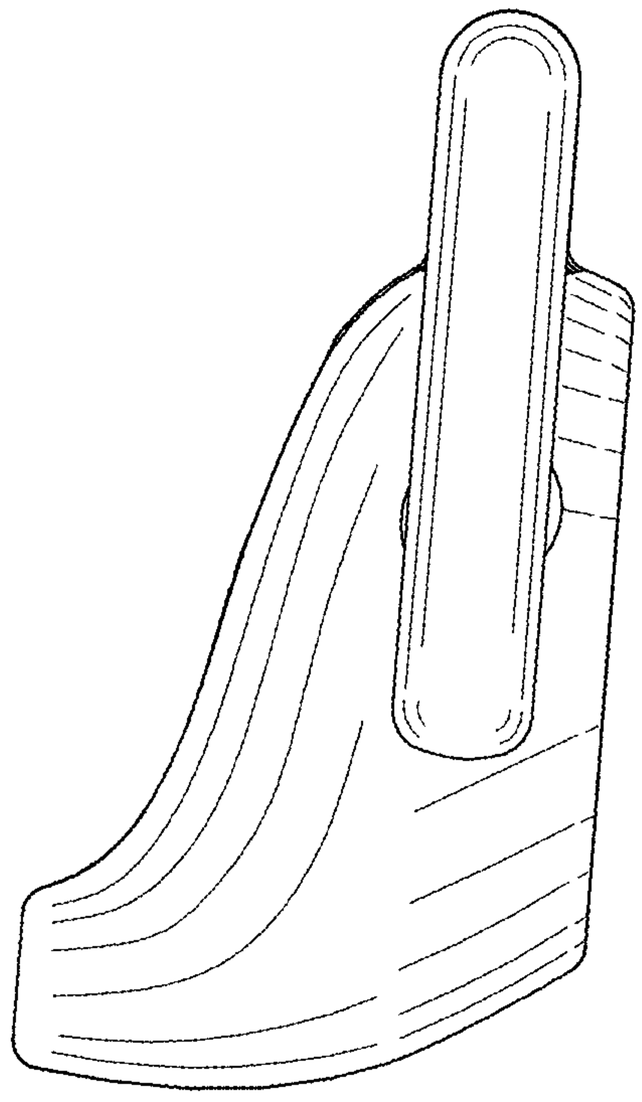

FIG. 12

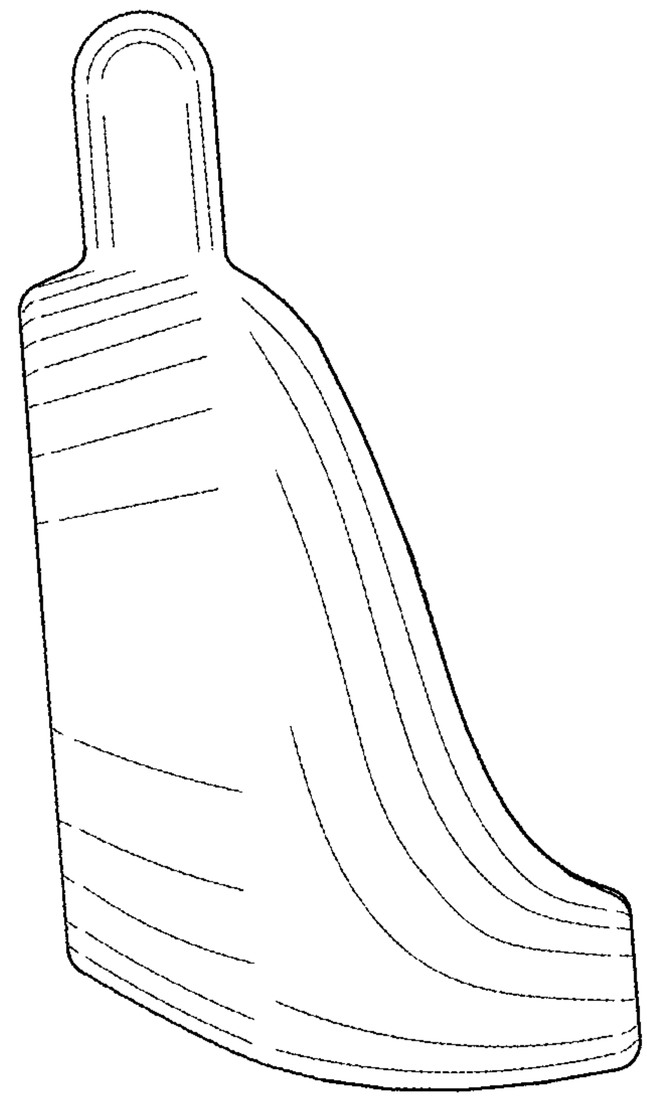

FIG. 13

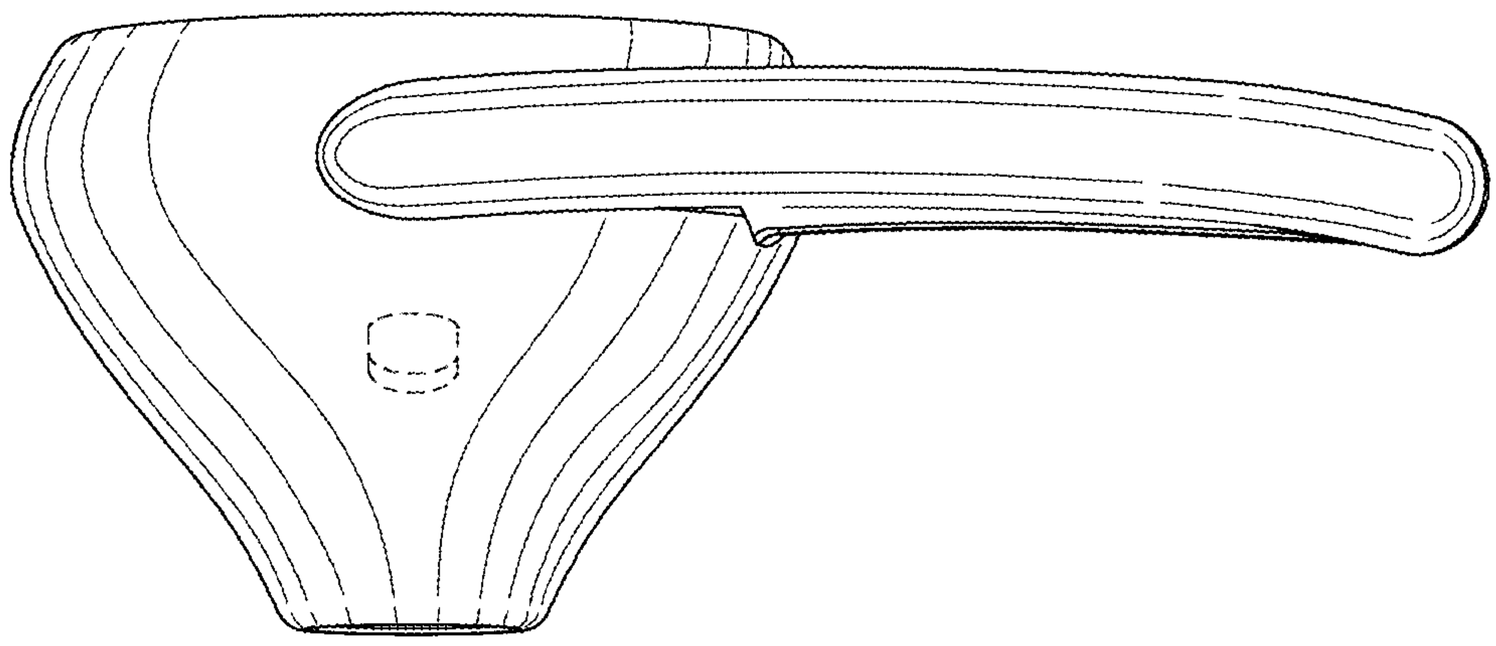

FIG. 14

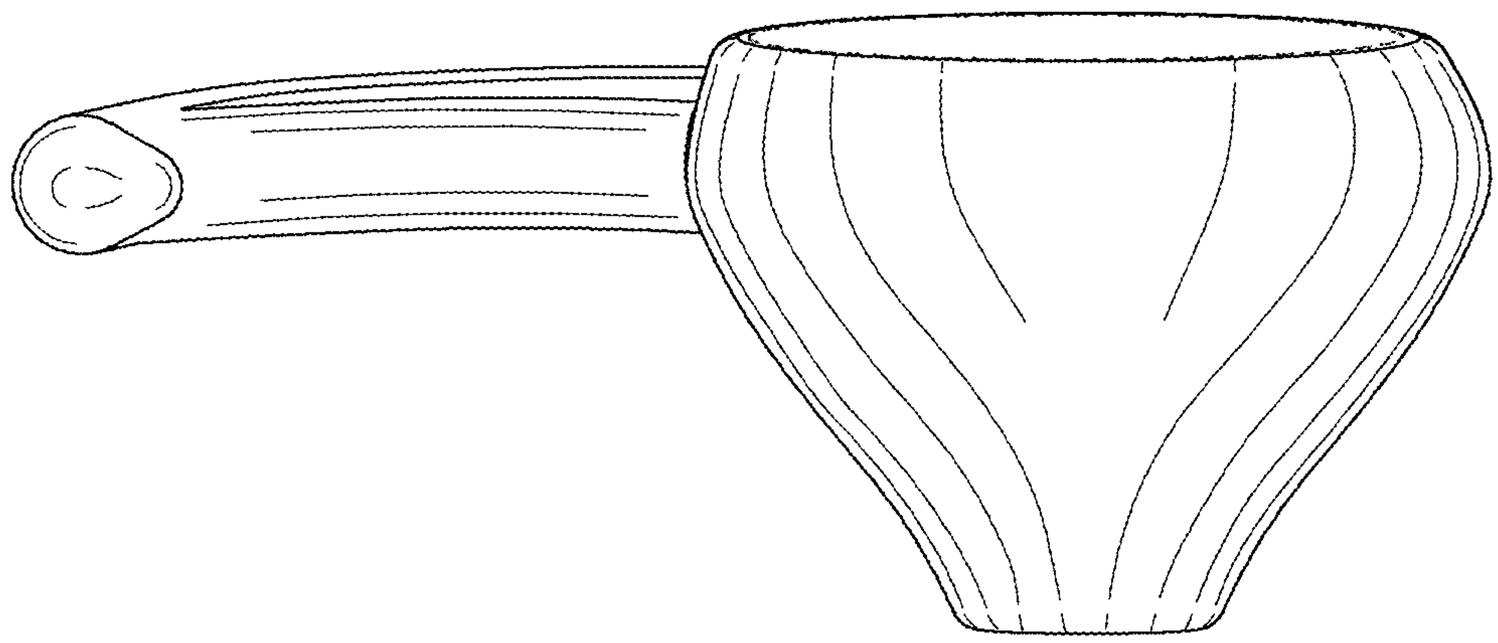

FIG. 15

EARBUD HEADPHONE ADAPTER

CROSS REFERENCE

This application is a non-provisional application claiming the benefit of Provisional Application No. 62/128,850 filed Mar. 5, 2015, which is incorporated by reference herein in its entirety for all purposes.

TECHNICAL FIELD

The present disclosure relates to adapters for earbud headphones.

BACKGROUND

Earbuds are generally a small type of headphone worn inside the ear. For example, earbuds are usually held in place by fitting in the cavum concha of the outer ear, and may at least partially insert into the ear canal of the user. Earbuds have many benefits over traditional over-ear headphones, such as improved storage and transportation due to a smaller size, an ability to be worn with hats and other head apparel, and a minimalist look. Typical earbuds comprise a housing which contains the speaker components and electrical connectivity through cords running to a media player device. However, earbuds are generally more susceptible to falling out of the ear of a user or becoming uncomfortable when worn over prolonged periods of time.

BRIEF SUMMARY

Among other things, embodiments provide for fitting an earbud into a human ear comfortably and securely while maintaining a high sound quality. For example, some embodiments are implemented as an earbud adapter structure having features that conform to fit securely over an earbud, features that comfortably secure the earbud in a wearer's ear (e.g., within the cymba concha and outer ear canal), and features that enable high sound quality and the like. In other embodiments, the earbud adapter may be implemented directly into the structure of the earbud headphone itself. Some embodiments are implemented by a hollow body having an earbud opening. The earbud opening extends about an earbud axis that is substantially perpendicular to a first plane. The earbud opening is configured to fit over an earbud headphone, and the hollow body tapers along at least a portion of the hollow body from the earbud opening to a sound opening according to an embodiment. The sound opening extends about a sound opening axis, where the sound opening axis is substantially perpendicular to a second plane. The first plane is parallel and offset from the second plane. The earbud opening has a cross-sectional area that is larger than the cross-sectional area of the sound opening, according to some embodiments. In some embodiments, a first distance between opposite sides of the cavity on the first plane is larger than a second distance between opposite sides of the cavity on the third plane. The sound opening of the hollow body is dimensioned to fit within an ear canal opening of a human ear. In some embodiments the sound opening axis is offset from the earbud axis in a first direction.

According to one embodiment, the earbud adapter has a stabilizer extending from the hollow body. The stabilizer is configured to engage with a cymba concha area of the ear while the sound opening is within the ear canal. The stabilizer extends generally along the first plane from a portion of the hollow body that is offset from the earbud axis in a second direction; the second direction generally opposite from the first direction.

According to another embodiment, the hollow body further comprises a cavity extending from the first plane to a third plane; the third plane being offset in an opposite direction to the first plane. The cavity has a larger cross-sectional area on the first plane than on the third plane. The cavity is configured to receive an earbud headphone and is formed of a material configured to stretch over the earbud headphone to securely retain it. At least one side of the cavity configured to conform to at least one side of an earbud headphone when the earbud headphone is inserted into the hollow body, in certain embodiments.

According to another embodiment, the hollow body of the earbud headphone adapter comprises a third opening located between the first plane and the second plane. The third opening is offset from the earbud axis along the second direction. The third opening may reduce vibratory feedback caused by sound emitted from the earbud headphone.

In some embodiments, the hollow body of the earbud headphone adapter may have a uniform wall thickness. Additionally, the earbud headphone adapter may be made from a silicone material; the silicone material may have a 55 shore A durometer hardness.

In some embodiments, the stabilizer has a first arm and a second arm; the first arm and the second arm each extend from the hollow body at separate locations; the location that the first arm extends from the hollow body is substantially opposite from the sound opening. The first and second arm join at a point, where the point is configured to contact a cymba concha area of the ear while the sound opening is within the ear canal opening.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying figures illustrate one or more embodiments of the disclosed earbud headphone adapter, and together with the detailed description serve to explain the aspects and implementations of the earbud headphone adapter. Embodiments are described in conjunction with the appended figures:

FIG. **1** shows a perspective view of the front of an earbud headphone that has an earbud headphone adapter fitted over a portion of the earbud headphone;

FIG. **2** shows a perspective view of the back of the earbud headphone adapter of FIG. **1**;

FIG. **3** shows a side, cross-sectional view of the earbud headphone adapter of FIG. **1** taken along plane A-A of FIG. **6**;

FIG. **4** shows a perspective view of the front of the earbud headphone adapter of FIG. **1**;

FIG. **5** shows a perspective, cross-sectional view of the earbud headphone adapter of FIG. **1** fitted over an earbud headphone, taken along plane A-A of FIG. **6**;

FIG. **6** shows a front view of the earbud headphone adapter of FIG. **1**;

FIG. **7** shows a view of a human ear;

FIG. **8** shows a view of an earbud headphone adapter positioned in a human ear;

FIG. **9** shows a perspective view of the front of an earbud headphone adapter;

FIG. **10** shows a back view of the earbud headphone adapter of FIG. **9**;

FIG. **11** shows a front view of the earbud headphone adapter of FIG. **9**;

FIG. **12** shows a first side view of the earbud headphone adapter of FIG. **9**;

FIG. **13** shows a second side view of the earbud headphone adapter of FIG. **9**;

FIG. **14** shows a top view of the earbud headphone adapter of FIG. **9**; and

FIG. **15** shows a bottom view of the earbud headphone adapter of FIG. **9**.

DETAILED DESCRIPTION

All illustrations of the drawings are for the purpose of describing selected embodiments and are not intended to limit the scope of the claims. The following detailed description of the drawings, along with the preceding brief description of the drawings, utilizes a directional convention to promote clarity. Vertically descriptive terms, such as top and bottom or up and down, relate to directions, locations, or view orientations of the earbud headphone adapter when worn in the ear of a user. The "front" of the earbud headphone adapter is the part or side which interfaces with the ear of a user when worn. The "back" of the earbud headphone adapter is the part or side which receives an earbud headphone and is thus generally opposite the front. The "sides" of the earbud headphone adapter correspond to the part or sides which are neither the back, front, top, nor bottom of the earbud headphone adapter.

FIG. **1** shows one embodiment of an earbud headphone adapter **100** coupled to an earbud headphone **101**. The earbud headphone adapter **100** fits over the earbud headphone **101** to alter how the earbud headphone **101** interacts, or interfaces, with an ear of a user (as shown in FIGS. **7** and **8**, for example). The earbud headphone adapter **100** may be made of any suitable material known in the art such that the earbud headphone adapter **100** is capable of fitting over and securely coupling to the earbud headphone **101**. For instance, one such suitable material is silicone, which, in addition to providing flexibility of the earbud headphone adapter **100**, has the added benefits of a low cost, ease of use in manufacturing, soft cushioning for a user's comfort, and/or the capacity to promote hygiene by being readily washable and/or a relatively resistant media to biological growth.

FIG. **2** shows an embodiment of the earbud headphone adapter **100** from a back perspective view. The earbud headphone adapter **100** comprises a hollow body **200**, an earbud opening **201**, and a stabilizer **202**. An earbud headphone **101** may be inserted into the earbud opening **201** where the earbud headphone **101** is received and secured by the hollow body **200**. During use, in one embodiment, the stabilizer **202** is shaped to interface with features of a human outer ear and is attached to the hollow body **200**. For example, the stabilizer **202** can secure the earbud headphone adapter **100** in place by fitting into and applying pressure to a cymba concha area located under the crus of antihelix in a human ear, as disclosed in FIGS. **7** and **8** and described in more detail below.

FIG. **3** shows a cut-away view of the earbud headphone adapter **100** taken along plane A-A of FIG. **6**. An earbud headphone **101** may be inserted into the hollow body **200** through the earbud opening **201**. When the earbud headphone **101** emits sound, the sound travels through the hollow body **200** and exits through a sound opening **302** into an ear canal opening **306** of a user (see also FIG. **7**). The sound opening **302** is therefore dimensioned to fit within the ear canal opening **306** of a user when the earbud headphone adapter **100** is fitted over an earbud headphone worn by the user, according to one embodiment. Further, the hollow body **200** may have a uniform wall thickness throughout, which advantageously facilitates the manufacturing process and integrity of the structure.

FIG. **3** also includes various superimposed axes and planes that are identified relative to each other and the structure of the earbud headphone adapter **100**. The structure of the hollow body **200** according to one embodiment may be described in terms of its relationships to the axes and planes defined in FIG. **3**. In some embodiments an earbud axis **300** is substantially perpendicular to a first plane **301**. A sound opening **302** is formed about a sound opening axis **303**; in some embodiments, the sound opening axis **303** is substantially perpendicular to a second plane **304**. The sound opening **302** may extend along the second plane **304**. The earbud opening **201** is formed about the earbud axis **300**; in some embodiments, the earbud axis **300** is substantially perpendicular to a third plane **305**. The earbud opening **201** may extend along the third plane **305**.

The earbud opening **201** may have first cross-sectional area on the third plane **305**, and the sound opening **302** may have a second cross-sectional area on the second plane **304**. In one embodiment, the hollow body **200** tapers along at least a portion of the hollow body **200** from the earbud opening **201** to the sound opening **302** such that the first cross-sectional area is larger than the second cross-sectional area. As used herein, "taper" generally refers to a gradual change in size in any suitable manner (e.g., according to a constant slope, according to an arc, in a step-wise manner, etc.) and in any suitable direction (e.g., from larger to smaller, from smaller to larger, from a starting size to larger then to smaller, etc.). For example, the tapering of the hollow body **200** from the earbud opening **201** to the sound opening **302** may get both wider and narrower as the tapering progresses. Further, the sound opening axis **303** is offset from the earbud axis **300** along a first direction indicated by arrow **307**, the first direction **307** may only be one component of the first direction and is generally oriented vertically downwards when the earbud headphone adapter **100** is worn in the ear of a user. Such an arrangement of the earbud headphone adapter **100** may comply with the anatomical structure of a user's ear, by positioning the sound opening **302** in the ear canal opening **306** such that in certain embodiments the sound opening axis **303** extends directly into the center of the ear canal opening **306** of a user.

In another embodiment, the hollow body **200** may have a region that forms a cavity **308**. The cavity **308** extends from the first plane **301** to the third plane **305**, the cavity terminating at the third plane **305** to form the earbud opening **201**. The cavity **308** has a larger cross-sectional area on the first plane **301** as compared to the third plane **305**. This is so the cavity **308** may at least partially stretch over an earbud headphone **101** so as to securely retain the earbud headphone **101** inserted through the earbud opening **201** into the hollow body **200** according to such embodiments. In some embodiments, a first distance between opposite sides of the innermost wall of the cavity **308** on the first plane **301** is larger than a second distance between opposite sides of the innermost wall of the cavity **308** on the third plane **201**. Thus, the cavity **308** may be made of any suitable material having an adequately flexible compliance such that the cavity **500** is capable of being stretched or fitted over the earbud headphone **101** as it enters the hollow body **200**. In this way, at least one side of the cavity **308** conforms to and/or "grips" the earbud headphone **101** when the earbud headphone **101** is inserted into the hollow body **200**. This aspect therefore substantially improves the functionality of

the earbud headphone adapter **100** in preventing the earbud headphone **101** from falling out, according to one embodiment of the present disclosure. According to another embodiment, the cavity **308** tightly conforming to the earbud headphone **101** provides additional benefits such as: creating a seal that further directs sound out of the sound opening **302**; increasing comfort of the user; or maintaining a closer vibratory relationship between the sound opening **302** and other features of the earbud headphone adapter **100**, such as the stabilizer **202**.

FIG. **4** shows a perspective view of the front of the earbud headphone adapter **100** of FIGS. **1-3**. As shown in FIG. **4**, the hollow body **200** may further include a third opening **400**, the third opening **400** being located on the hollow body **200** between the first plane **301** and the second plane **304**. The third opening **400** may be offset from the earbud axis **300** in a second direction, the second direction being opposite the first direction **307**. In one embodiment, the third opening **400** preserves and enhances the sound quality of an earbud headphone **100** by preventing of the hollow body **200** from covering additional openings on an earbud headphone **101**. Many earbud headphones have more than one opening. Additional openings on the earbud headphone **101** may provide pressure relief and/or additional speaker output holes. The third opening **400** is configured to correspond to such additional openings of said earbud headphone **101** when said earbud headphone **101** is inserted into the earbud headphone adapter **100**, according to some embodiments. For example the third opening **400** may allow sound emitted from such additional openings or other areas of the speakers of said earbud headphones to exit the hollow body **200** and enter the outer structure of the ear of a user when worn. The presence of two openings through which sound can pass, namely the sound opening **302** and the third opening **400** according to one embodiment, further improves the relative sound quality. Where said earbud headphones include speakers that are not designed to be inserted into a user's ear canal, the absence of the third opening **400** may in some cases result in increased vibratory feedback caused by sounds emitted from the earbud headphone **101**, in turn decreasing the overall quality of the sound and experience of the user.

FIG. **5** shows a perspective cross-sectional view, taken along plane A-A of FIG. **6**, of the earbud headphone adapter **100** fitted over an earbud headphone **101**, according to one embodiment. A side **500** of the cavity **308** is configured to conform to at least one side **501** of the earbud headphone **101** when the earbud headphone **101** is inserted into the earbud headphone adapter **100**. In some embodiments, an earbud sound output **502** of the earbud headphone **101** may be oriented in such a way as to not emit sound directly into the ear canal opening **306** of a user. It may be advantageous for the earbud headphone adapter **100** to grip the earbud headphone **101** along a first headphone axis **503** and direct sound emitted from the earbud sound output **502** to exit the sound opening **302** in the direction of the sound opening axis **303**.

FIG. **6** shows a front view of an embodiment of the present disclosure. As noted above, the stabilizer **202** can be shaped to engage with features of the human ear to provide a secure fit between the earbud headphone **101** and a wearer. Providing such a secure fit can involve forming a stabilizer **202** structure that has both desired overall shape and strength characteristics. Accordingly, the stabilizer can include any suitable legs, arcs, and/or other features for enabling such a secure fit. The stabilizer **202** of the earbud headphone adapter **100** may be formed in a crescent shape according to one embodiment, as shown in FIG. **6**. The stabilizer **202** extends from the hollow body **200** at an outer surface **603** of the hollow body **200** and generally along the first plane **301** in the second direction (opposite the first direction). In some embodiments the stabilizer **202** extends from the hollow body **200** at a first stabilize base portion **606** and a second stabilizer base portion **607**. In certain embodiments the stabilizer is substantially opposite from the sound opening **302** at the point at which it extends from the hollow body **200** and located vertically upwards from the earbud axis **300** when the earbud headphone adapter **100** is worn in the ear of a user. The stabilizer **202** is configured to contact a cymba concha area **701** of the ear of a user when worn such that the sound opening **302** is within the ear canal opening, as further illustrated by FIGS. **7** and **8**. The stabilizer **202**, in extending away from the hollow body **200** along the first plane **301**, curves back toward the sound opening **302** in a partial spiral configuration, causing it to take on a crescent shape. The crescent-shaped stabilizer **202** ends at a stabilizer point **605** in a manner designed to couple with the anatomical structure of a user's ear when worn. The stabilizer **202** may further comprise a first arm **601** and a second arm **602** to increase flexibility and capacity for physical compliance, which accommodates various anatomical dimensions of users' ears. The longer outer edge **600** of the stabilizer **202**, shown in FIG. **6** along the outer edge of the first arm **601** of the stabilizer **202**, is positioned to contact the cymba concha area **701** of a user's ear (shown in FIG. **7**). In such an embodiment, the first arm **601** and the second arm **602** extend from the hollow body **200** at two different locations and join at a juncture **604**. The stabilizer **202** has a hollow portion between said arms **601**, **602** in one embodiment. The hollow portion could also have additional embodiments between said arms **601**, **602**, including this area being solid, having a mesh pattern, or other structures connecting the arms **601** and **602**. According to some embodiments the stabilizer has alternative shapes that are adapted to interface with the cymba concha including for example the arms of the stabilizer **202** may be hollow, the stabilizer may also have only one arm, more than two arms, no arms, or any number of structures. The outer edge **600** of the stabilizer **202** may take on a variety of shapes, and does not necessarily have to be a continuous curve. Other embodiments may have the stabilizer **202** not generally formed along the first plane **301** or there could be one or more portions that do not conform to the first plane **301** in either direction. Likewise, the stabilizer **202** may attach to the hollow body **200** at different points than shown in FIG. **6**.

FIG. **7** shows a side view of a human ear **700**, the ear comprising a cymba concha area **701**, a cavum concha **702**, an antihelix, a crus of helix, a crus of antihelix **703**, and an ear canal opening **306**.

FIG. **8** shows the earbud headphone adapter **100** positioned in the ear **700** of FIG. **7** as it is worn by a user, according to one embodiment. The stabilizer **202** is configured to contact the cymba concha area **701** such that the earbud headphone adapter **100** is secured to the ear **700** when the sound opening **302** is within the ear canal opening **306** of a user. In such an embodiment, this configuration helps prevent the earbud headphone adapter **100** from coming loose or falling out of the ear **700** of the user during movement or physical activity. According to some embodiments the stabilizer **202** engages the cymba concha area **701** by fitting under antihelix **703**, when the sound opening **302** is within the ear canal opening **306** of a user. The stabilizer **202** may further extend along the cymba concha area **701** until its termination point between the crus of helix and the crus of antihelix.

The hollow body **200** and the stabilizer **202** may be made out of any suitable flexible material, including without limitation silicone having a 55 shore A durometer hardness, according to one embodiment. The hardness optimizes both flexibility and structural integrity according to some embodiments of the present disclosure.

FIGS. **9-15** illustrate an additional embodiment of an earphone headphone adapter.

In other embodiments, at least a portion of the earbud headphone adapter or aspects thereof may be implemented as part of the earbud headphone itself, such that at least a portion of the earbud headphone adapter is configured to be fixed or sealed to the earbud headphone. For example, at least a portion of the earbud headphone adapter may be fixed or sealed onto the earbud headphone by an adhesive or through the manufacturing process of the earbud headphone, the earbud adapter, or both. In some embodiments, the earbud opening is fixed or sealed onto the earbud headphone and is configured to be non-removable from the earbud headphone by a user. In such embodiments, the earbud opening is not necessarily stretched over the earbud headphone, but may be wrapped around the earbud headphone and then fixed or sealed to the earbud headphone. Further, in some embodiments, the cavity may be fixed or sealed onto the earbud headphone (in addition to the earbud opening) and is configured to be non-removable from the earbud headphone by a user. In such embodiments, the stabilizer may also be fixed or sealed to the portion of hollow body that is fixed or sealed to the earbud headphone. In other embodiments, the stabilizer may be fixed or sealed directly to an earbud headphone that is shaped substantially as embodiments of the earbud adapter described in this disclosure.

While a number of aspects and embodiments have been discussed above, persons having ordinary skill in the art will recognize certain modifications, permutations, additions, and equivalents may alternatively be used or introduced. It is intended that the scope of the following claims are interpreted to include all such modifications, permutations, additions, and equivalents. The terms and expressions used herein are for description, not limitation, and there is no intention to exclude any equivalents of the aspects shown and described.

What is claimed is:

1. An earbud headphone adapter comprising:

a hollow body having:

an earbud opening, the earbud opening extending about an earbud axis, the earbud axis being normal to a first plane, the earbud opening is configured to fit over an earbud headphone, the hollow body tapering along at least a portion of the hollow body from the earbud opening to a sound opening, the sound opening extending about a sound opening axis, the sound opening axis being normal to the first plane,

wherein the circumference of the sound opening is parallel to and offset from the first plane, wherein a first cross-sectional area of the earbud opening at the first plane is larger than a second cross-sectional area of the sound opening, the sound opening of the hollow body being dimensioned to fit within an ear canal opening of an ear, and wherein the sound opening axis is offset from the earbud axis along a first direction;

a cavity extending from the first plane to the earbud opening, wherein the circumference of the earbud opening is parallel to and offset from the first plane, wherein the first plane is situated between the earbud opening and the sound opening, wherein a first distance between opposite sides of the cavity on the first plane is larger than a second distance between opposite sides of the cavity on the earbud opening, the cavity configured to receive the earbud headphone, and wherein the cavity is formed of a material configured to stretch over the earbud headphone to securely retain it; and

a stabilizer configured to engage a cymba concha area of the ear while the sound opening is within the ear canal opening, the stabilizer positioned normal to the sound opening axis, such that the stabilizer defines the first plane, the stabilizer extending from a portion of the hollow body that is offset from the earbud axis in a second direction that is opposite the first direction.

2. The earbud headphone adapter of claim **1**, wherein the hollow body further comprises a third opening, the third opening located between the first plane and the sound opening.

3. The earbud headphone adapter of claim **2**, wherein the third opening is offset from the earbud axis along the second direction.

4. The earbud headphone adapter of claim **3**, wherein the third opening is sized and positioned to reduce vibratory feedback caused by sounds emitted from the earbud headphone.

5. The earbud headphone adapter of claim **1**, wherein the hollow body has a uniform wall thickness.

6. The earbud headphone adapter of claim **1**, wherein the hollow body and the stabilizer are comprised of a silicone material.

7. The earbud headphone adapter of claim **6**, wherein the silicone material has a 55 shore A durometer hardness.

8. The earbud headphone adapter of claim **1**, wherein at least one side of the cavity contacts at least one side of the earbud headphone when the earbud headphone is inserted in the hollow body.

9. The earbud headphone adapter of claim **1**, wherein an outer edge of the stabilizer curves toward the sound opening along the first plane, the outer edge positioned to contact the cymba concha area of the ear while the sound opening is within the ear canal opening.

10. The earbud headphone adapter of claim **1**, wherein the stabilizer further comprises a first arm and a second arm, wherein the first arm and the second arm extend from the hollow body at different locations, the first arm extending from the hollow body opposite from the sound opening, wherein the first arm and the second arm join at a juncture configured to engage the cymba concha area of the ear while the sound opening is within the ear canal opening.

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